Music and Media Technologies 23 – 24
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Lecture 2: Introduction to Unity

Class topics:

- **Overview of Augmented Reality and Mixed Reality – contd from Lecture 1**
- **Assignment 1 Overview and focus:**
  - **Demo of completed projects – Benjamin Boam, Sofia Harmen and Nicholas Pender**
  - **Review parts of Assignment 1**

- **INTRODUCTION TO UNITY**
  - **Introduction to the interface**
  - **Scene view controls – moving in 3D space in Unity**
  - **Creating a new Scene**
  - **Create a terrain: add mountains, trees and grass, texture and skybox**
  - **Building the game to a .exe**

Assignment 1 process and roadmap

Journey through the assignment: today we will look at the general roadmap and how to use Unity to create the technical structure. Each week we will isolate a part of the journey and focus on that.

Sample files are located in Lecture 2 > resources folder:

UNITY INSTALLATION

Needed for work in Unity: a mouse with wheel and ability to right and left click

- Unity install should be completed before class
- Unity Hub – place to keep your projects, access to tutorials, can keep different versions of Unity (might be necessary!)
- If you need to add components/other versions of Unity, you can go to Unity Hub > Add > Add another version that you have downloaded (e.g. 2019.2).

- Use full releases (denoted with f) and add modules as needed.
- For assignment 1 you will be building .exe/application and you will need to add Windows Build support and Documentation (if you are on Mac)

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UNITY HUB – EXPLORE:

- **Projects**
  - List of projects > can see editor version
  - Add > add project from disk (if you want to review someone else's project)
  - New project
- **Installs**
  - List of editors installed
  - Locate – if you have downloaded a version – can install via this area
  - Install Editor > locate an editor
- **Learn**
  - Access to Unity Learn from this area
  - Of interest to you:
    - Explore the unity editor
    - Welome to Unity essentials
    - Create with VR
    - Welcome to the vr pathway
- **Community**
  - Unity Asset Store : access to 3D models, audio etc
  - Blog
  - Discussions
  - Forums

Introduction to the interface: creating a new project and scene

- Make a folder (in your Documents folder, for example) that will be your Unity projects folder e.g. Documents > Unity Projects.
  - Consider where this will be located, based on your needs.
  - For example, an external hard drive if you need your work to be mobile ie. from home to College
  - Your computer hard drive
  - Cloud > consider upload speed etc. (on campus or at home)

- Projects tab (top left) > New project > select version of Unity: 2022.3.9f1> 3D > change Project Name > select folder area – Create Project > Unity will start up > Save the project
  - NB: at later stage, you can explore the other templates

  For lectures and learning, I would recommend, you work in the same project each week. You can create a new Scene for each lesson/topic.
  - Remaining in the same project will allow you quick access to all the files/various learnings and software functions that you have incorporated over the classes.
  - While working at home or on your assignment, you can create a separate project for your own learning/create new Scenes for each time you try something new.

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- **UNITY WINDOWS:**
  - Take a look at the various windows in the project.Based on your knowledge of other softwares, have a think about the window functions.
  - You can move windows around to make things appear better (for you)
  - Use Windows > Layout to select different layouts.
    - Try 2 by 3 and 4 split.
    - Default to reset and go back to the first layout.
    - Separate Game and Scene tabs: drag Game window by the tab/label to move it underneath Scene window and put it back.
  - Customise your windows to suit your needs and Windows > Save Layout e.g. Move Game underneath and save (Window > Layout > Save Layout)
  - Default is fine!

Window functions:

- Scene window: *your visual workspace* - a scene is the place where you construct your world/level in your game.
- Game window: where you view the playback of your creation and from the appropriate angle.
- Hierarchy window: list of everything in your scene (graphics, cameras, lights…) and shows how items are linked.

Set up your space:

You can close any windows that you are not using at the moment. Right-click and close tab. Would recommend closing: Timeline, Animation, Console (for the moment)

- Remember that Scene and Game are linked in that Scene is where you build and Game is where you view the finished outcome.
- Be able to view the Scene and Game windows at the same time by moving the Game window beside or below Scene window.
  - This will be very helpful when you are first getting used to working in 3D and positioning items in space.
- You can have multiple Scene windows open – this will allow you to view the world and position of objects from different angles.
- You can always open a window again by going to Menu > Window and locating the window you need.

3D space, in any software, is dependent on the presence of a camera and light source

- Think about the use of the camera in cinema: the camera allows us to view the space from different angles – we can look left to right etc, can be in certain positions (above, below objects)
- We can move the camera through the space: e.g. tracking motion
- A light source gives us a sense of depth: think about the sun in clear sky at midday and how it casts hard and long shadows

- **Hierarchy window** > you will see a SampleScene. This is a default scene that appears when you make a new Project – click into it and you will see (in the Scene window) that it contains a camera and light source. - expand the icon in

Commented [FC1]: https://docs.unity3d.com/2019.2/Documentation/Manual/UsingTheSceneView.html

https://docs.unity3d.com/2019.2/Documentation/Manual/SceneViewNavigation.html

https://docs.unity3d.com/2019.2/Documentation/Manual/PositioningGameObjects.html

https://docs.unity3d.com/2019.2/Documentation/Manual/UsingCustomEditorTools.html

the Hierarchy window and you will see the 2 objects (camera and light source) (Make sure you are viewing the Scene window)
- click on Main camera icon in the Hierarchy window – you can move the camera in the x,y, z axis using the arrows. (red-x, green-y, blue-z)
- Note: Small window in bottom right > Camera view appearing in Scene view – you can see the direction the camera is facing
- click on the Directional Light icon – you can see the direction the light is pointing – this can be moved e.g. you want a light to behave as if it is the sun at midday.

GAMEOBJECT: everything is a game object i.e. *camera, light*, a cube, an asset that you have imported

- Menu – Gameobject > examine the list
- > 3D Object, select 3D > Cube. It appears, as a default, in the **centre of the** Scene window and in the Hierarchy window.
    - Move the cube until you can see it in your Game window
    - Add another 3D object e.g. a Sphere, and move it in the Scene window
    - Click on camera icon in Scene window. **You can see the preview window appear in the bottom right corner.**
    - This is your Main Camera and shows you the camera preview of the game. (The camera is the Point Of View here). Move the camera (on x, y and z axis) to re-position it in front of the cube.
    - To view your creation, press the Play button to see the game and objects in it. It will take a few seconds to build. The Game tab is activated. This window shows you the finished product, with all inherent movement and interaction (when you start adding movement).
    - Press Play again to stop the gameplay/close the Game tab.

      You can't edit in Play mode/Game window so make sure you have stopped Play mode, when you are finished viewing the scene.

    - Scene Tab versus Game Tab:
        - Exercise: move the Cube in Scene view (select the Cube in the Hierarchy window and drag the Cube in the Scene window). Click into Game view and you will see the Cube has moved.
        - Drag Game Tab over to the right or underneath the Scene window, and you can view edits (you make in Scene window) in realtime in the Game View.

Commented [FC2]: https://docs.unity3d.com/2019.2/Documentation/Manual/Hierarchy.html

Commented [FC3]: https://docs.unity3d.com/2019.2/Documentation/Manual/GameView.html

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Inspector window: this window allows you to view more detailed parameters and data versions of parameters for any Gameobject

- Hierarchy window > click the light icon and in the Inspector window, view further lighting parameters and controls; change something like colour.
- click cube to highlight the object and view parameters
- Do the same for the Main camera icon
- Notice the Inspector tab updates to show different parameters of each of these objects (as you select and deselect).
- *Class work: alter some parameters for the various gameobjects.*
  - Inspector tab: select the Cube and try to change some Transform properties e.g. Scale.
    - For example, scroll down to Add Component > can add components/behaviours to any gameobject e.g. Physics to the Cube; video player to a cube.

Project window: contains the Assets in your game/world/environment.

- Assets are any of the files you use in your game: scenes, objects; music and audio; models, textures, scripting etc. When you import assets into your game, they appear here. At the moment, the assets are the SampleScene, default gameobjects and the gameobjects you have placed in there

Console window: for when you are running a game – use this to spot errors etc

Asset Store tab: store of assets, made by developers. Lots of free and small fee assets.

- Window > Asset Store > this used to be accessible here but is now fully online. You must import through the Package Manager now.
- To download: Window > Package Manager > Instead of Packages: In Project, choose My Assets > sign in >>> (If you haven't done so already, create an account)

- To browse assets, go back to Assets Tab > click search online > browse for free assets > 3D > find something you like and choose Add to my Assets > Accept Terms > can choose to open in your Unity project (open in Unity) or Add to My Assets. Select Add to my Assets and collect a number of interesting assets. Because you are logged in, these will be saved in your Assets online and can be brought into any Unity project.
- Get these now: Free Trees | 3D Trees | Unity Asset Store and https://assetstore.unity.com/packages/2d/textures-materials/nature/grass-and-flowers-pack-1-17100
- Examples of free assets – go to pricing and enter 0 to 0 or select Free Assets
  - Hospital Bed- Free 3D Asset | 3D Interior | Unity Asset Store
  - Free Low Poly Nature Asset | 3D Vegetation | Unity Asset Store
  - Free Stylized Garden Asset | 3D Exterior | Unity Asset Store
  - Free Pixel Art Forest | 2D Nature | Unity Asset Store

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- Free Trees | 3D Trees | Unity Asset Store
- World Space Trees (FREE) - Shader | VFX Shaders | Unity Asset Store
- Rock and Boulders 2: https://assetstore.unity.com/packages/3d/props/exterior/rock-and-boulders-2-6947
- Conifers [BOTD]: https://assetstore.unity.com/packages/3d/vegetation/trees/conifers-botd-142076
- AllSky Free - 10 Sky / Skybox Set (used for sun glow effect): https://assetstore.unity.com/packages/2d/textures-materials/sky/allsky-free-10-sky-skybox-set-146014
  B. Classic Skybox | 2D Sky | Unity Asset Store
- https://assetstore.unity.com/packages/3d/characters/animals/butterfly-animated-58355
- Industrial/urban landscape: https://assetstore.unity.com/packages/3d/environments/industrial/rpg-fps-game-assets-for-pc-mobile-industrial-set-v2-0-86679
- Important assets: Starter Assets - First Person Character Controller | Essentials | Unity Asset Store and Starter Assets - Third Person Character Controller | Essentials | Unity Asset Store
- For you to explore: high resolution 3D scans/models **Quixel Megascans – assets store:** https://quixel.com/megascans/home/ 4k resolution – for you to explore

- Assets can be still or animated. Preview them to decide if they are suitable.
- You have to create an account to access assets.
- Assets will appear in the Package manager. You can select and download them from there.
  - Collect new assets in the Store and in Unity, refresh the list by choosing the refresh button at the bottom of the list.
- You can give this its own space in the Interface if you are spending time browsing.

- Class work: browse the store and find some assets to work with – bookmark some for purchase.

  To download: Window > Package Manager > Instead of Packages: In Project, choose My Assets > sign in >>>find assets > Import > they will appear in another dialog box and you can decide to take all or select some : they will then appear in the Project:Assets

Homework: Review these notes and go through the Manual to get more details on each window:

https://docs.unity3d.com/Manual/LearningtheInterface.html

Help in Unity:

- Search
- Unity Manual

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- Inspector – hover/reference

SCENE VIEW CONTROLS

Become familiar with these basic scene controls – make sure to practice these controls as homework

Make sure to set up your windows so that you can view Scene and Game simultaneously. As you update/edit in Scene view, you will see the result in the Game window.

A. Scene view basic controls

- Right-click and hold to pan/move around scene
- Left-click to select
- Right-click and use W A S D keys to rotate and move around Scene. (Go slow at the start!). Hold Shift to go quicker.
- Use the wheel to zoom in and out.
- **To find an object in the Scene, double click** on item in Hierarchy e.g. Cube. When you have Cube selected, you can see the directional axes. You can move the Cube around.
- Class work: add another Gameobject to the Scene. Move both objects by dragging on directional cones (x, y, z). You can see the faces of the cube in the middle – green, red and blue to represent the directions. Move Cube around using these.

B. Scene Gizmo

The **Scene Gizmo** appears in the upper-right corner of the **Scene** view. This displays the **Scene** view **Camera** 's current orientation (Perspective view)

Class work: view this link - https://docs.unity3d.com/Manual/SceneViewNavigation.html

You want to remain in **Perspective** view, for most of the time. The Orthographic/Isometric view has no perspective, and is useful in combination with clicking one of the conical axis arms to get a front, top or side elevation.

If your Scene view is in an awkward viewpoint (upside-down, or just an angle you find confusing), **Shift**-click the cube at the centre of the Scene Gizmo to get back to a **Perspective** view with an angle that is looking at the Scene from the side and slightly from above.

Click on the padlock on the top right of the Scene Gizmo to enable or disable rotation of the Scene. Once Scene rotation is disabled, right-clicking the mouse pans the view instead of rotating it.

C. **Toolbar controls:** Class/home work: watch this video to practise Scene view controls https://www.youtube.com/watch?v=nG0fXdXyIMI (11"29)

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a. Hand/magnify, Move tool, Rotate, Scale (drag a side of the Cube), Rect (freeform scale so doesn't adhere to proportion), Move/Scale/Rotate (all in the one go).

i. Classwork: Duplicate the cube and position it – right click the cube in Hierarchy and Duplicate > give it a new name e.g. SecondCube

ii. explore the Scene view controls for the different objects

IMPORTANT NOTE on HOUSEKEEPING your files:

As mentioned earlier, it is best to work within the same Unity project for this module and your assignments. This will, for example, give you access to all assets that you import into the project at all times.

All assets and scenes can be stored within the project and you can have access to assets and scenes from within.

Recommend: you start a new Scene for each lecture so that you have Scene examples of lecture content for your own reference and access to the Assets. You may create 1 or more scene per lecture, depending on the topic being addressed.

Create a New Scene

A few ways to create a new Scene:

- Menu: Assets > Create > Scene > select 3DScene. Save this scene e.g. Lecture2learning. The other scene will close but note, you can access it quickly in Project window > Scenes

  a. Alternative way: Assets window > Right-click > Create > Scene

  b. Another alternative: File > New Scene

1. Give it a name (e.g. Lecture02) and Save. NB: File > Save – this saves the new scene. Save Project is different – do that too!
2. You will see that the new Scene has appeared in the Assets>Scenes folder
3. Open both scenes separately and view.

Create a terrain: adding ground

- Assets > select the Scene, Lecture02 (You might choose to create a new Scene and call it CreatingTerrain)
- Select Hierarchy window > right click > 3D object > terrain (or go to Menu > gameobject > 3D> terrain)
- Position your Main Camera so that you can see the Terrain (View positioning in the Game window to be more accurate). (In Toolbar > select Move tool so that you can view the position arrows). Take note of the Main Camera position (Inspector window > Transform > Position) and the terrain position.
- Class work: Go into Game mode and make sure you can 'see' the terrain with your Main camera.

- Select the terrain object in the Hierarchy window and locate it in the Scene window.
  - Class work: Move around the Scene window and find the terrain. Modify its location in the space. (use the Scene controls and toolbar to slightly alter its parameters)
  - Select the terrain object in the Hierarchy window and look at its parameters in the Inspector window.

Let's create some ground with Terrain tools using Terrain editing tools in the Inspector

Commented [FC4]: Explore Terrain tools here: https://docs.unity3d.com/Manual/terrain-UsingTerrains.html

The **toolbar** provides five options to adjust your Terrain:

- Create adjacent Terrain tiles. (Create Neighbour Terrain tiles button)
- Sculpt and paint your Terrain. (Paint terrain button)
- Add trees.
- Add details such as grass, flowers, and rocks.
- Change general settings for the selected Terrain.

(More info: https://docs.unity3d.com/Manual/terrain-UsingTerrains.html)

Classwork

1. **Create Neighbour terrains button**: select and click tiles to extend the current terrain. Notice that the Hierarchy window now has 1 or more terrain objects. Refer to the Manual for more explanation on settings: https://docs.unity3d.com/Manual/terrain-CreateNeighborTerrains.html

2. Paint Terrain

   ----Has 6 options in the dropdown list.

   Alter brush types – size, opacity, shape

   Paintbrush button https://docs.unity3d.com/Manual/terrain-Tools.html

EXPLORE Paint Texture:

i. choose Raise or Lower Terrain > Hold and left click to raise Terrain, Shift and left click to lower.
ii. Paint Holes
iii. Change Paint texture
iv. Stamp Terrain
v. set Height
vi. smooth height,

3. **Paint Trees tool:**
   https://docs.unity3d.com/Manual/terrain-Trees.html

   See Trees: no trees defined.
   To add trees > Edit Trees > Add Tree window > Tree Prefab (nothing there)

Add Tree Assets first

Explore the following tree packages:

Free Trees | 3D Trees | Unity Asset Store

World Space Trees (FREE) - Shader | VFX Shaders | Unity Asset Store

> Add to My Assets > Open in Unity/Go to my Assets > Check Package manager – Trees Assets should be there > Download and Import > When complete, the Trees folder should appear in the Project/Assets window.

***Review trees and materials in the Assets folder and take note of ones you might use. ***

NB: Window > Package Manager > Dropdown list and view My Assets – will contain all assets you have downloaded from the store/access to them on the store so you can re-download them

- Go back to Terrain object > Paint trees tool > Edit trees > Add tree > tree prefab > click circle at right > search for tree you like e.g. Fir, Conifer, Palm Tree, Broadleaf and click Add. Add a number of trees. (Review the Manual on bend factor and Making Trees Bend in the Wind)

  - Inspector window > Trees > you should have the trees you added.
  - Select one you would like to add > Mass Place Trees > alter number > Place OR Draw them in yourself.
  - Alter Tree Density, Brush Size Tree Height. Explore what these settings do.

4. Paint Details Tool: https://docs.unity3d.com/Manual/terrain-Grass.html
   No detail objects defined so you will have to add >
   Can add https://assetstore.unity.com/packages/2d/textures-materials/nature/grass-and-flowers-pack-1-17100

   - View assets when they appear in Assets folder (GrassFlowers)

     When they are downloaded and imported > Select terrain object > Paint details> Edit Details > New Brush > add multiple brushes of flowers, grass etc

   - To add grass, edit settings for brush size etc and add to the terrain.

Make the environment more interesting

Add texture to terrain:

Import texture: A texture is a bitmap image. You can create textures in a digital content creation application, such as Photoshop, and import them into Unity. Or find them:

i. search free game textures on the Assets store .e.g Outdoor Ground Textures | 2D Floors | Unity Asset Store

Commented [FC5]: https://docs.unity3d.com/Manual/terrain-Trees.html
If the Tree **Prefab** that you are importing supports **Bend Factor**, the **Add Tree** window displays a **Bend Factor** property for adjusting wind responsiveness. Trees created with the SpeedTree Modeler don't have a **Bend Factor**; only those created with Tree Editor do. See the section on **Making Trees bend in the wind**, below.

ii. https://www.poliigon.com/textures/free

Spend time browsing and downloading textures that you might use.

My examples:

1. https://assetstore.unity.com/packages/2d/textures-materials/floors/hand-painted-grass-texture-78552
2. https://assetstore.unity.com/packages/2d/textures-materials/floors/pbr-sand-materials-free-160123

In a 3D Project, Unity imports image and movie files in the Assets folder as Textures. As long as the image meets the specified size requirements, Unity imports and optimizes it for game use. This extends to multi-layer Photoshop PSD or TIFF files.

Commented [FC6]: From the Unity Manual

To apply a texture/image files to the Terrain object in Unity:

b. Click on Terrain object in your Scene > Brush tool in Inspector window > Select **Paint texture** at dropdown > down to terrain layers: edit terrain layers > create layer – window appears that allows you choose any texture there or that you import – choose something like Grass/Sand. You can choose to remove layer/replace/keep it. Edit Terrain Layers > add layer – maybe add grass this time. Build up your choice of layers/textures here.
c. Paint the terrain! Make brush really big and paint. Press play to view

Commented [FC7]: https://docs.unity3d.com/2019.3/Documentation/Manual/terrain-PaintTexture.html More on adding layers

Class work: add multiple layers to your world

Add Skybox

To make the sky: Window > Rendering > Lighting > Environment > Skybox Material – click circle to right of that to access assets (All Skys and Classic Skybox) – scroll to find sky material – sky has updated in Scene and Game view. Play game and explore.

EXAMPLE: Finnian Hurley (MMT, 20_21) https://vimeo.com/674802634
password: XR_110222Finnian

Export game as a .exe

a. Save everything
b. File > Build Settings > Make sure you have the necessary scenes in Scenes In Build. Either drag in scenes or Add Open Scenes. NB: whatever is on top is the first scene that is loaded so ideally use the Menu scene so game doesn't load to any level!
c. Target platform > Windows, Mac and Linux Standalone > my settings are Windows and x86, Development build (adds a watermark), Compression – default
d. Build > make folder for game. Call it myBuilds – you can store all builds in there. Build and Run or build and open it from your myBuilds folder > When build is finished, go to the folder and view the resulting files. One will have the Unity icon – this is your app/.exe file. Open the exe and 'play it'. (When submitting the assignment, go up a folder level, zip the entire folder and submit that. Test it is working by sending to a colleague to check they can a) download b) access files

and c)view and interact with your world).
To close: you will need to force quit.

HOMEWORK:

1. Practice the Scene view controls – page 3 – 4 and become very familiar with your orientation in 3D space and ways to move around
2. Practice the terrain tools and painting trees etc
3. Go to Assets store on the Browser and explore for suitable assets
4. Go over this lesson and modify the game objects to your liking.
5. Start thinking about the application you are going to develop e.g. choose music and decide on the visual space and objects